

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Original): A process for preparing a solid highly reactive polyurethane composition containing uretdione groups by mixing

A) at least one uretdione-containing curing agent which has a free NCO content of less than 5% by weight and a uretdione content of 1-30% by weight, based on aromatic, aliphatic, (cyclo)aliphatic or cycloaliphatic polyisocyanates and hydroxyl-containing compounds, with a melting point of from 40 to 130°C,

and

B) if desired at least one hydroxyl-containing polymer having a melting point of from 40 to 130°C and an OH number of between 20 and 200 mg KOH/gram,

C) in the presence of at least one catalyst

C1) of the formula $M(OR^1)_n(OR^2)_m(OR^3)_o(OR^4)_p(OR^5)_q(OR^6)_r$, where M is a metal in any positive oxidation state and identical to the sum $n+m+o+p+q+r$, m, o, p, q and r are integers from 0 to 6 and the sum $n+m+o+p+q+r = 1-6$, the radicals R^1-R^6 simultaneously or independently of one another are hydrogen or alkyl, aryl, aralkyl, heteroaryl or alkoxyalkyl radicals having 1-8 carbon atoms and the radicals may in each case be linear or branched, unbridged or bridged with other radicals, to form monocyclic, bicyclic or tricyclic systems, and the bridging atoms may in addition to carbon also be heteroatoms and additionally may have one or more alcohol, amino, ester, keto, thio, urethane, urea or allophanate groups, double bonds, triple bonds or halogen atoms,

and/or

C2) comprising tetraalkylammonium salts of the formula $[NR^1R^2R^3R^4]^+[R^5]^-$, where R^1-R^4 simultaneously or independently of one another are

alkyl, aryl, aralkyl, heteroaryl or alkoxyalkyl radicals having 1-18 carbon atoms and being in each case linear or branched, unbridged or bridged with other radicals R^1 - R^4 , to form monocyclic, bicyclic or tricyclic systems, and the bridging atoms may in addition to carbon also be heteroatoms, and each radical R^1 - R^4 may further contain one or more alcohol, amino, ester, keto, thio, urethane, urea or allophanate groups, double bonds, triple bonds or halogen atoms, and R^5 is either OH or F,

and/or

C3) of the formula $[NR^1R^2R^3R^4]^+ [R^5COO]^-$, where R^1 - R^4 simultaneously or independently of one another are alkyl, aryl, aralkyl, heteroaryl or alkoxyalkyl radicals having 1-18 carbon atoms and being in each case linear or branched, unbridged or bridged with other radicals R^1 - R^4 , to form monocyclic, bicyclic or tricyclic systems, and the bridging atoms may in addition to carbon also be heteroatoms, and each radical R^1 - R^4 may further contain one or more alcohol, amino, ester, keto, thio, urethane, urea or allophanate groups, double bonds, triple bonds or halogen atoms, and R^5 is an alkyl, aryl, aralkyl, heteroaryl or alkoxyalkyl radical, linear or branched, having 1-18 carbon atoms and may further contain one or more alcohol, amino, ester, keto, thio, acid, urethane, urea or allophanate groups, double bonds, triple bonds or halogen atoms,

and/or

C4) comprising metal acetylacetonates of the formula $M^{n+} (acac^-)_n$, where M = metal ion, n is a natural number, with n = 1-6, and acac is bis(2,4-pentanedionato),

C5) comprising phosphonium compounds of the formula $[PR^1R^2R^3R^4]^+ [R^5]^-$, where R^1 - R^4 simultaneously or independently of one another are alkyl, aryl, aralkyl, heteroaryl or alkoxyalkyl radicals having 1-18 carbon atoms and being in

each case linear or branched, unbridged or bridged with other radicals R^1 - R^4 , to form monocyclic, bicyclic or tricyclic systems, and the bridging atoms may in addition to carbon also be heteroatoms, and each radical R^1 - R^4 may further contain one or more alcohol, amino, ester, keto, thio, urethane, urea or allophanate groups, double bonds, triple bonds or halogen atoms, and R^5 is either OH or F or is R^6 COO where R^6 is synonymous with alkyl, aryl, aralkyl, heteroaryl or alkoxyalkyl radicals, linear or branched, having 1-18 carbon atoms and may further contain one or more alcohol, amino, ester, keto, thio, acid, urethane, urea or allophanate groups, double bonds, triple bonds or halogen atoms,

so that the fraction of the catalyst under C) is 0.001-5% by weight of the total amount of components A) and, if present, B),

D) if desired, a reactive compound which is able to react at elevated temperatures with the acid groups of component B) that may be present and whose fraction is from 0.1 to 10% by weight based on the total amount of A) and, if present, B),

E) if desired, at least one acid in monomeric or polymeric form, in a weight fraction, based on the total formulation, of from 0.1 to 10%,

F) if desired, auxiliaries and additives

in a mixing apparatus selected from an extruder, intensive kneader, intensive mixer or static mixer, component C) being added subsequently in the mixing apparatus to components A) and, if present, B), D), E) and/or F) already partly or fully mixed in the mixing apparatus and being mixed with the other components and subsequently isolating the end product by cooling.

Claim 2 (Original): The process as claimed in claim 1, wherein component C) is added to the mixture after from 10 to 90% of the overall length of the mixing apparatus.

Claim 3 (Original): The process as claimed in claim 1, wherein component C) is added to the mixture after from 20 to 90% of the overall length of the mixing apparatus.

Claim 4 (Original): The process as claimed in claim 1, wherein component C) is added to the mixture after from 30 to 90% of the overall length of the mixing apparatus.

Claim 5 (Original): The process as claimed in claim 1, wherein component C) is added to the mixture after from 40 to 80% of the overall length of the mixing apparatus.

Claim 6 (Original): The process as claimed in claim 1, wherein component C) is added to the mixture after from 55 to 75% of the overall length of the mixing apparatus.

Claim 7 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein the temperature on addition of component C) is from 70 to 170°C.

Claim 8 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein component A) is based on the polyisocyanates selected from isophorone diisocyanate (IPDI), hexamethylene diisocyanate (HDI), 2-methylpentane diisocyanate (MPDI), 2,2,4-trimethylhexamethylene diisocyanate/2,4,4-trimethylhexamethylene diisocyanate (TMDI), norbornane diisocyanate (NBDI), methylenediphenyl diisocyanate (MDI) and tetramethylxylylene diisocyanate (TMXDI).

Claim 9 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein polyesters, polythioethers, polyethers, polycaprolactams, polyepoxides, polyesteramides, polyurethanes and/or, if desired, low molecular mass di-, tri- and/or tetraalcohols as chain extenders and/or, if desired, monoamines and/or monoalcohols as chain terminators are present as hydroxyl-containing compounds of component A).

Claim 10 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein polyesters, polyethers, polyacrylates, polyurethanes and/or polycarbonates having an OH number of from 20 to 200 mg KOH/gram are present as component B).

Claim 11 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein compounds selected from lithium hydroxide, sodium hydroxide, potassium hydroxide, rubidium hydroxide, cesium hydroxide, beryllium hydroxide, magnesium hydroxide, calcium hydroxide, strontium hydroxide, barium hydroxide, aluminum hydroxide, zinc hydroxide, lithium methoxide, sodium methoxide, potassium methoxide, magnesium methoxide, calcium methoxide, barium methoxide, lithium ethoxide, sodium ethoxide, potassium ethoxide, magnesium ethoxide, calcium ethoxide, barium ethoxide, lithium propoxide, sodium propoxide, potassium propoxide, magnesium propoxide, calcium propoxide, barium propoxide, lithium isopropoxide, sodium isopropoxide, potassium isopropoxide, magnesium isopropoxide, calcium isopropoxide, barium isopropoxide, lithium 1-butoxide, sodium 1-butoxide, potassium 1-butoxide, magnesium 1-butoxide, calcium 1-butoxide, barium 1-butoxide, lithium 2-butoxide, sodium 2-butoxide, potassium 2-butoxide, magnesium 2-butoxide, calcium 2-butoxide, barium 2-

butoxide, lithium isobutoxide, sodium isobutoxide, potassium isobutoxide, magnesium isobutoxide, calcium isobutoxide, barium isobutoxide, lithium tert-butoxide, sodium tert-butoxide, potassium tert-butoxide, magnesium tert-butoxide, calcium tert-butoxide, barium tert-butoxide, lithium phenoxide, sodium phenoxide, potassium phenoxide, magnesium phenoxide, calcium phenoxide and/or barium phenoxide are present as catalysts C1).

Claim 12 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein compounds selected from methyltributylammonium hydroxide, methyltriethylammonium hydroxide, tetramethylammonium hydroxide, tetraethylammonium hydroxide, tetrapropylammonium hydroxide, tetrabutylammonium hydroxide, tetrapentylammonium hydroxide, tetrahexylammonium hydroxide, tetraoctylammonium hydroxide, tetradecylammonium hydroxide, tetradecyltriethylammonium hydroxide, tetraoctadecylammonium hydroxide, benzyltrimethylammonium hydroxide, benzyltriethylammonium hydroxide, trimethylphenylammonium hydroxide, triethylmethylammonium hydroxide, trimethylvinylammonium hydroxide, tetramethylammonium fluoride, tetraethylammonium fluoride, tetrabutylammonium fluoride, tetraoctylammonium fluoride and/or benzyltrimethylammonium fluoride are present as catalysts C2).

Claim 13 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein compounds selected from tetramethylammonium formate, tetramethylammonium acetate, tetramethylammonium propionate, tetramethylammonium butyrate, tetramethylammonium benzoate, tetraethylammonium formate, tetraethylammonium acetate, tetraethylammonium propionate, tetraethylammonium butyrate, tetraethylammonium benzoate, tetrapropylammonium formate, tetrapropylammonium

acetate, tetrapropylammonium propionate, tetrapropylammonium butyrate, tetrapropylammonium benzoate, tetrabutylammonium formate, tetrabutylammonium acetate, tetrabutylammonium propionate, tetrabutylammonium butyrate and/or tetrabutylammonium benzoate are present as catalysts C3).

Claim 14 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein compounds selected from zinc acetylacetonate and/or lithium acetylacetonate are present as catalysts C4).

Claim 15 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein compounds selected from tetrabutylphosphonium acetate, tetrabutylphosphonium benzotriazolate, tetrabutylphosphonium hydroxide, ethyltriphenylphosphonium acetate, tetraphenylphosphonium phenoxide, trihexyltetradecylphosphonium decanoate and/or tetrabutylphosphonium fluoride are present as catalysts C5).

Claim 16 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein compounds selected from triglycidyl ether isocyanurate (TGIC), EPIKOTE 828 (diglycidyl ether based on bisphenol A, Shell), Versatic acid glycidyl esters, ethylhexyl glycidyl ether, butyl glycidyl ether, POLYPOX R 16 (pentaerythritol tetraglycidyl ether, UPPC AG) and other Polypox grades containing free epoxy groups, VESTAGON EP HA 320, (hydroxyalkylamide, Degussa AG), or phenylenebisoxazoline, 2-methyl-2-oxazoline, 2-hydroxyethyl-2-oxazoline, 2-hydroxypropyl-2-oxazoline, 5-hydroxypentyl-2-oxazoline, sodium carbonate and/or calcium carbonate are present as component D).

Claim 17 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein compounds selected from sulfuric acid, acetic acid, benzoic acid, malonic acid, terephthalic acid, copolyesters and/or copolyamides having an acid number of at least 20 are present as component E).

Claim 18 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein additional catalysts, leveling agents, light stabilizers, fillers and/or pigments are present as component F).

Claim 19 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein an extruder is used as apparatus.

Claim 20 (Currently Amended): The process as claimed in claim 19, wherein single-screw or multiple-screw extruders, ~~especially twin-screw extruders~~, planetary roll extruders or annular extruders are used.

Claim 21 (Currently Amended): The process as claimed in ~~at least one of the preceding claims~~ claim 1, wherein the residence time of the ingredients in the abovementioned apparatus is from 3 seconds to 15 minutes, ~~preferably from 3 seconds to 5 minutes, more preferably from 5 to 180 seconds.~~

Claim 22 (Currently Amended): The process as claimed in ~~at least one preceding claims~~ claim 1, wherein mixing takes place at a temperature below 170°C.

Claim 23 (Original): A solid highly reactive polyurethane composition containing uretdione groups and obtained by mixing

A) at least one uretdione-containing curing agent which has a free NCO content of less than 5% by weight and a uretdione content of 1-30% by weight, based on aromatic, aliphatic, (cyclo)aliphatic or cycloaliphatic polyisocyanates and hydroxyl-containing compounds, with a melting point of from 40 to 130°C,

and

B) if desired at least one hydroxyl-containing polymer having a melting point of from 40 to 130°C and an OH number of between 20 and 200 mg KOH/gram,

C) in the presence of at least one catalyst

C1) of the formula $M(OR^1)_n(OR^2)_m(OR^3)_o(OR^4)_p(OR^5)_q(OR^6)_r$, where M is a metal in any positive oxidation state and identical to the sum $n+m+o+p+q+r$, m, o, p, q and r are integers from 0 to 6 and the sum $n+m+o+p+q+r = 1-6$, the radicals R^1-R^6 simultaneously or independently of one another are hydrogen or alkyl, aryl, aralkyl, heteroaryl or alkoxyalkyl radicals having 1-8 carbon atoms and the radicals may in each case be linear or branched, unbridged or bridged with other radicals, to form monocyclic, bicyclic or tricyclic systems, and the bridging atoms may in addition to carbon also be heteroatoms and additionally may have one or more alcohol, amino, ester, keto, thio, urethane, urea or allophanate groups, double bonds, triple bonds or halogen atoms,

and/or

C2) comprising tetraalkylammonium salts of the formula $[NR^1R^2R^3R^4]^+[R^5]^-$, where R^1-R^4 simultaneously or independently of one another are alkyl, aryl, aralkyl, heteroaryl or alkoxyalkyl radicals having 1-18 carbon atoms and being in each case linear or branched, unbridged or bridged with other radicals R^1-R^4 ,

to form monocyclic, bicyclic or tricyclic systems, and the bridging atoms may in addition to carbon also be heteroatoms, and each radical R^1-R^4 may further contain one or more alcohol, amino, ester, keto, thio, urethane, urea or allophanate groups, double bonds, triple bonds or halogen atoms, and R^5 is either OH or F,

and/or

C3) of the formula $[NR^1R^2R^3R^4]^+ [R^5COO]^-$, where R^1-R^4 simultaneously or independently of one another are alkyl, aryl, aralkyl, heteroaryl or alkoxyalkyl radicals having 1-18 carbon atoms and being in each case linear or branched, unbridged or bridged with other radicals R^1-R^4 , to form monocyclic, bicyclic or tricyclic systems, and the bridging atoms may in addition to carbon also be heteroatoms, and each radical R^1-R^4 may further contain one or more alcohol, amino, ester, keto, thio, urethane, urea or allophanate groups, double bonds, triple bonds or halogen atoms, and R^5 is an alkyl, aryl, aralkyl, heteroaryl or alkoxyalkyl radical, linear or branched, having 1-18 carbon atoms and may further contain one or more alcohol, amino, ester, keto, thio, acid, urethane, urea or allophanate groups, double bonds, triple bonds or halogen atoms,

and/or

C4) comprising metal acetylacetonates of the formula $M^{n+} (acac^-)_n$, where M = metal ion, n is a natural number, with n = 1-6, and acac is bis(2,4-pentanedionato),

C5) comprising phosphonium compounds of the formula $[PR^1R^2R^3R^4]^+ [R^5]^-$, where R^1-R^4 simultaneously or independently of one another are alkyl, aryl, aralkyl, heteroaryl or alkoxyalkyl radicals having 1-18 carbon atoms and being in each case linear or branched, unbridged or bridged with other radicals R^1-R^4 , to form monocyclic, bicyclic or tricyclic systems, and the bridging atoms may in addition to

carbon also be heteroatoms, and each radical R^1 - R^4 may further contain one or more alcohol, amino, ester, keto, thio, urethane, urea or allophanate groups, double bonds, triple bonds or halogen atoms, and R^5 is either OH or F or is R^6 COO where R^6 is synonymous with alkyl, aryl, aralkyl, heteroaryl or alkoxyalkyl radicals, linear or branched, having 1-18 carbon atoms and may further contain one or more alcohol, amino, ester, keto, thio, acid, urethane, urea or allophanate groups, double bonds, triple bonds or halogen atoms,

so that the fraction of the catalyst under C) is 0.001-5% by weight of the total amount of components A) and, if present, B),

D) if desired, a reactive compound which is able to react at elevated temperatures with the acid groups of component B) that may be present and whose fraction is from 0.1 to 10% by weight based on the total amount of A) and, if present, B),

E) if desired, at least one acid in monomeric or polymeric form, in a weight fraction, based on the total formulation, of from 0.1 to 10%,

F) if desired, auxiliaries and additives

in a mixing apparatus selected from an extruder, intensive kneader, intensive mixer or static mixer, component C) being added subsequently in the mixing apparatus to components A) and, if present, B), D), E) and/or F) already partly or fully mixed in the mixing apparatus and being mixed with the other components and subsequently isolating the end product by cooling.

Claim 24 (Currently Amended): The solid highly reactive polyurethane composition containing uretdione groups as claimed in claim 23, comprising compounds A) to F) as set forth in ~~at least one of claims~~ claim 2 to 22.

Claim 25 (Currently Amended): The use of a solid polyurethane composition containing uretdione groups and prepared as set forth in ~~at least one of claims~~ claim 1 ~~to 22~~, curing at a low baking temperature, for producing a powder coating material.